9.0 SERVICE AND PERFORMANCE INFORMATION

9.1 CONTACT INFORMATION

If the pump fails to respond to the operating or troubleshooting procedures listed in this manual, and the cause cannot be determined, discontinue using the pump.

Service and product performance information may be obtained from the manufacturer by contacting:

B. Braun
1601 Wallace Drive, Suite 150
Carrollton, Texas 75006
Attn: Manager of Service
Or Call: (800) 627-PUMP
(800) 627-7867

Product complaints may be sent to the Manager of Quality Assurance at the above address. With each complaint, please include the serial number or lot number of the product involved, a description of the difficulty experienced, information regarding the pressure limit and flow rate setting, the type of I.V. fluid in use, the message displayed at the time the difficulty occurred, the diagnostic code number (if applicable), and any other information which might aid in the investigation of the complaint.

Should it be necessary to return the pump to the manufacturer, carefully pack the pump (preferably in the original packing, FZ0012 Horizon Shipping Carton Kit), and ship it prepaid to the above address. The manufacturer cannot assume any responsibility for loss or damage to returned instruments while they are in transit.

Authorization to return products must be received from B. Braun prior to shipment. Please contact Customer Service at the above phone number for a Returned Materials Authorization Number.

With each question or complaint, please include:

- ☑ the pump's serial number,
- ☑ a description of the difficulty experienced,
- ☑ the pressure limit setting,
- ☑ the rate setting,
- ☑ the initial volume(s) to be infused,
- ☑ the type of fluid(s),
- ☑ the amount of time between the start of the infusion and the time the difficulty was noticed,
- ☑ the message displayed at the time the difficulty occurred, and
- ☑ the catalog and lot number of the set(s) in use.

10.0 MONITOR DOCKING

10.1 DESCRIPTION

Monitor Docking, a feature of the Horizon Nxt Modular Infusion System, provides communication from the pump to a cardiac monitor. This allows for vital infusion information, such as rate, volume to be infused, volume infused, and pump alarms, to be displayed on the patient's cardiac monitor, at the bedside and/or at a central nurses' station.

Monitor Docking reduces the amount of time used to determine the whereabouts and type of alarm. Eventually, Monitor Docking may be used as a part of overall computerized nurse charting system.

WARNING: Read this chapter before using the Monitor Docking feature. The user should become familiar with the proper use of this feature and the Horizon Nxt Infusion Pump.

For technical assistance, call
B. Braun
1-800-627-PUMP
1-800-627-7867

10.2 INSTALLATION

Note: Monitor Docking must be enabled in the pump by the Biomedical Department for this feature to be accessible. The Serial Data Communication IR Module will be connected by the Biomedical Department to the cardiac monitor.

10.2.1 System Requirements

Table 10-1 lists the equipment required for successful Monitor Docking.

Table 10-1: System Requirements

Infusion Pump:	B. Braun Horizon Nxt Infusion Pump
Cardiac Monitoring Systems:	Marquette SpaceLabs HP CareVue
Cardiac Monitoring Module:	Vendor Specific
P.C. Docking Kit:	Part No. FZ 501458

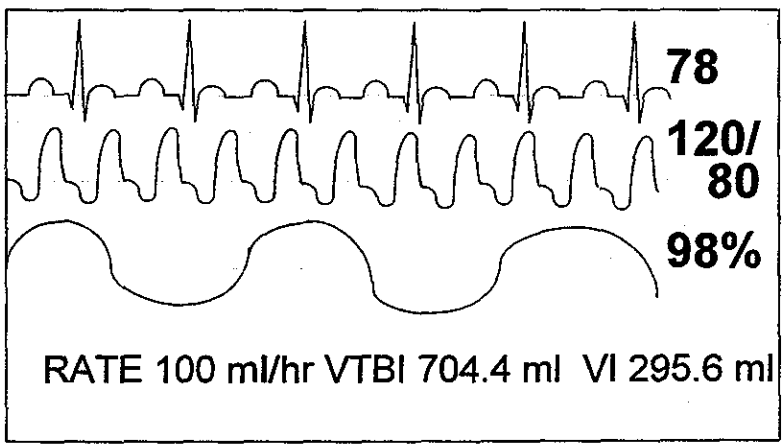
10.2.2 Docking Set Up

1. Clamp the Serial Data Communication IR Module over the Serial Data Communication fluid resistant window on the back of the Horizon Nxt Pump whose information you wish displayed.
    a. Grasp the Serial Data Communication IR Module with index finger on top and thumb on grooved surface on the bottom.
    b. Hook the top of the unit onto the pump and press with thumb to clamp the unit on the back of the pump case.

2. Enter the Biomed Menu (see Section 7.5.1 for instructions on how to enter the Biomed Menu).
3. Press the down Cursor Keys to select "Monitor Docking."

Note: Selecting Check Alarm Log, Check Operation Log, or Set Options via PC will temporarily suspend the Monitor Docking function.

4. Press the Enter Key.
5. Press the Cursor Keys to select the appropriate cardiac monitor system.
6. Press the Enter Key.
7. Press the Cursor Key to select "Exit from Menu."
8. Ensure the IR Module cable is connected securely to the back of the cardiac monitor.
9. Rate, volume to be delivered, and volume infused will now be displayed on the cardiac monitor.



10. Monitor screens may be customized. Contact your cardiac monitor manufacturer to discuss display format options.

10.2.3 Disconnecting Monitor Docking

1. Grasp the Serial Data Communication IR Module with index finger and thumb as before.
2. Press with thumb on grooved surface to release clamp.

10.3 STORAGE AND MAINTENANCE

Store the Serial Data Communication IR Module in a clean, dry area, temperatures not to exceed 90° F.

Return cable to Biomedical Department if tears, fraying, or loose cords are noted. Do not immerse in water or other fluids.

10.4 TROUBLESHOOTING

Table 10-2: Troubleshooting

If no date is displayed on the cardiac monitor once the IR module is connected...	1. Ensure cable is securely fastened to back of the cardiac monitor. 2. Clean Serial Data Communication Window on back of pump with damp cloth. Dry thoroughly. 3. Ensure sensors on IR Module are clean and free of obstruction. 4. Confirm cardiac monitor model and software revision are compatible with Horizon Nxt Monitor Docking feature.
If still no data is displayed...	1. Verify transmitting LED is not bent. If damaged, replace Main PCB.

APPENDIX A: Abbreviations and Symbols

This section lists the abbreviations, acronyms, and symbols that are used throughout the document. Many of the items have duplicates for reasons of standard usage within a respective field or industry.

A/D = analog to digital converter
AL = piezo electric alarm
AL = aluminum
ASIC = application specific integrated circuit
ASSY = assembly
AWG = american wire guage
BT = battery
C = capacitor
CAP = capacitor
CER = ceramic
CF = carbon film
COMM = communication
CONN = connector
CR = diode
CS = light detector
CT = thermistor
D = light emitting diode
DAC = digital to analog converter
DIO = diode
DIP = dual inline package
E = jumper
EEPROM = electrically erasable programmable read only memory
ELEC = electrolytic
EPLD = electrically programmable logic device
EPROM = erasable programmable read only memory
FET = field effect transistor
FPGA = field programmable gate array
FU = fuse
IC = integrated circuit
IR = infrared
J = connector
JMP = jumper
LCD = liquid crystal display
LED = light emitting diode
MF = metal film
MONCER = monolithic ceramic
MOV = metal oxide varistor
MOX = metal oxide
N-CH = n-channel
NC = no connection
NTC = negative temperature coefficient
OPTN = option
OTP = one time programmable
P = jumper

PC = personal computer
PCB = printed circuit board
PLCC = plastic leaded chip carrier
POLY = polycarbonate
PPH = Phillips pan head
PTC = positive temperature coefficient
P-CH = p-channel
Q = transistor
R = resistor
RAM = random access memory
RP = resistor package
RT = thermistor
SEC = secondary item
SIP = single in-line package
SW = switch
TH = thermistor
U = integrated circuit
VR = varistor
WW= wire wound
XSTR = transistor
XTAL = crystal
Y = crystal

APPENDIX B: Troubleshooting Guide

When troubleshooting the pump, always begin by reading the information displayed by the LCD. There will be times when the user has simply not read the LCD prior to declaring the pump at fault or out of order. Some form of instruction will always be displayed by the LCD.

This troubleshooting guide is primarily oriented to those events which cause the device to alarm. There are 117 different alarm codes in use. In the following table, if a code number is not listed, then it is not in use. Other types of malfunctions are included at the end of this list. In order for this list to be of use, it will be necessary for you to obtain the diagnostic code from the Alarm or Operation Log.

The message that is displayed on the LCD when an alarm occurs will vary depending upon the cause of the alarm. For those cases in which the pump has determined that the fault was most likely caused by or could be remedied by the user, these alarms will be defined as "user type" alarms. For user type alarms, the help message displayed will be in the form of either actions to take to remedy the alarm or a list of possible causes of the alarm. All other types of alarms will display either "System Alarm" or "Repair Instrument." System Alarm differs from Repair Instrument in that once the alarm has been silenced, pressing the RUN Key will reinitiate the infusion. Repair Instrument alarms require the pump being powered off then back on again prior to being able to reinitiate the infusion, very similar to turning your computer off and then back on again to clear a fault.

Repair or replacement of certain components can cause the configuration of the Horizon Nxt Pump to revert to factory settings. Upon completion of the repair process, ensure the device is programmed to the institution's preferred settings.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
1	SOLU	1. Fluid source is empty, or excessive air in cassette 2. Cassette not loaded properly. 3. Cassette failure. 4. Jammed refill piston. 5. Jammed inlet or transfer valves. 6. Solenoid jammed, out of adjustment or loosely mounted. 7. Mechanical failure of solenoid driving the transfer valve. 8. Petal module stuck or jammed. 9. Failure of solenoid driver circuitry on Main PCB. 10. Failure of the pressure transducer and/or its associated circuitry.	1. Re-fill the fluid source, or check cassette for air. 2. Reload the cassette (follow instructions inside door). 3. Inspect cassette for abnormalities, such as something besides fluid inside the pouches, etc. 4. Check for freedom of movement. Clean refill piston with warm water. 5. Check the inlet and transfer valve for freedom of movement by pressing on the valve tips with your finger. Clean if sticking. 6. Make sure the solenoid mounting screws are secure. Check the solenoid gap adjustment and inspect for evidence of failure such as discoloration from heat or squeaking operation. Make sure the Phillips screws used to attach the entire mechanism assembly to the bezel are secure. 7. Replace the half door/bezel assembly. 8. Remove and clean petal module with warm water. 9. Replace the Main PCB. 10. Inspect the pressure transducer for damage. Replace half door/bezel assembly.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
2	Error locating restriction/outlet valve closed position/ SYS Err	1. Optical sensor on restriction/outlet valve yoke failure or sensor is dirty. 2. Restriction/outlet valve is jammed. 3. Connector to restriction/outlet valve yoke sensor is loose or dislodged. 4. Restriction/outlet valve yoke out of adjustment. 5. Restriction motor failure. 6. Motor driver circuitry on Main PCB failure.	1. Clean the sensor surface. If problem continues, replace the half door/bezel assembly. 2. Check the restriction/outlet valve for freedom of movement by pressing on the valve tips with your finger. Clean with warm water. 3. Reseat the restriction/outlet valve yoke connector. Check for broken wire at the connector. 4. Check the restriction/outlet valve yoke adjustment and adjust as necessary (see Section 7.7.2.1). 5. Replace the restriction motor or half door/bezel assembly. 6. Replace the Main PCB.
3	Initial delivery chamber pressure too high/ SYS Err	1. Failure of pressure transducer. 2. Defective bezel assembly.	1. Inspect pressure transducer for damage. Test the pressure transducer (see Section 7.7.1.1). 2. Replace the half door/bezel assembly.
4	Main motor windings are bad/ SYS Err	1. Main motor failure. 2. Main motor connection failure. 3. Main motor circuitry on the main PCB failure.	1. Check main motor connection. 2. Replace half door/bezel assembly. 3. Replace main PCB.
5	Maximum initial retraction steps exceeded/ SYS Err	1. Main motor failure. 2. Main motor encoder assembly and/or sensor dirty, loose, or failed. 3. Main PCB failure.	1. Replace the half door/bezel assembly. 2. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. Encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place. 3. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
6	No more refills allowed/ SOLU	1. Fluid source is empty, or excessive air in cassette. 2. Cassette not loaded properly. 3. Cassette failure. 4. Jammed inlet or transfer valves. 5. Solenoid jammed, out of adjustment, or loosely mounted. 6. Stuck refill piston. 7. Mechanical failure of mechanism or connection through the interface PCB. 8. Failure of solenoid driver circuitry on Main PCB. 9. Failure of the pressure transducer and/or its associated circuitry. 10. Stuck or jammed petal module.	1. Re-fill the fluid source, or check cassette for air. 2. Reload the cassette (follow instructions inside door). 3. Inspect cassette for abnormalities, such as something besides fluid inside the pouches, etc. 4. Check the inlet and transfer valves for freedom of movement by pressing on the valve tips with your finger. Clean and or lubricate the valve shaft with silicon spray as needed. Do not spray the valve tips. 5. Make sure the solenoid mounting screws are secure. Check the solenoid adjustment and inspect for evidence of failure such as discoloration from heat or squeaking operation. Make sure the Phillips screws used to attach the entire mechanism assembly to the bezel are secure. 6. Clean piston area with warm water. 7. Replace the solenoid or half door/bezel assembly. 8. Replace the Main PCB. 9. Inspect the pressure transducer for damage. Replace half door/bezel assembly. 10. Remove and clean petal module with warm water.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
7	Outlet valve cannot close/ SYS Err	1. Cassette not loaded properly. 2. Cassette failure. 3. Jammed restriction/outlet valve. 4. Restriction/outlet valve yoke out of adjustment. 5. Optical sensor on restriction/outlet valve yoke failure or sensor surface is contaminated. 6. Restriction motor driver circuitry on Main PCB failure. 7. Restriction motor failure.	1. Reload the cassette (follow instructions inside door). 2. Inspect cassette for abnormalities, such as something besides fluid inside the pouches, etc. 3. Check the restriction/outlet valve for freedom of movement by pressing on the valve tips with your finger. 4. Check the restriction/outlet valve yoke adjustment (see Section 7.7.2.1). 5. Clean the optical sensor and check connections then retry operation. If this fails to correct the problem, replace the half door/bezel assembly. 6. Replace the Main PCB. 7. Replace the restriction motor assembly.
8	Outlet valve cannot open/ SYS Err	1. Jammed restriction/outlet valve. 2. Restriction/outlet valve yoke out of adjustment. 3. Optical sensor on restriction/outlet valve yoke failure or sensor surface is contaminated. 4. Restriction Motor driver circuitry on Main PCB failure. 5. Restriction motor failure.	1. Check the restriction/outlet valve for freedom of movement by pressing on the valve tips with your finger. 2. Check the restriction/outlet valve yoke adjustment (see Section 7.7.2.1). 3. Clean the optical sensor and check connections, then retry operation. 4. Replace the Main PCB. 5. Replace the restriction motor or half door/bezel assembly.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
9	Outlet valve leaking/ SYS Err	1. Cassette not loaded properly. 2. Cassette failure. 3. Jammed restriction/outlet valve. 4. Restriction/outlet valve yoke out of adjustment. 5. Optical sensor on restriction/outlet valve yoke failure or sensor surface is contaminated. 6. Restriction motor driver circuitry on Main PCB failure. 7. Restriction motor failure.	1. Reload the cassette (follow instructions inside door). 2. Inspect cassette for abnormalities, such as something besides fluid inside the pouches, etc. 3. Check the restriction/outlet valve for freedom of movement by pressing on the valve tips with your finger. 4. Check the restriction/outlet valve yoke adjustment (see Section 7.7.2.1). 5. Clean the optical sensor and check connections, then retry operation. If this fails to correct the problem, replace the half door/bezel assembly. 6. Replace the Main PCB. 7. Replace restriction motor or half door/bezel assembly.
10	Outlet valve motor windings bad/ SYS Err	1. Restriction motor failure. 2. Restriction motor connection failure. 3. Restriction motor driver circuitry on main PCB failure.	1. Replace the restriction motor. 2. Check the restriction motor connection. 3. Replace the half door/bezel assembly. 4. Replace the main PCB.
11	Outlet valve and main motor windings bad/ SYS Err	1. Restriction motor connection failure. 2. Restriction motor failure. 3. Main motor connection failure. 4. Motor driver circuitry on main PCB failure.	1. Check the restriction motor connection. 2. Replace restriction motor. 3. Check main motor connection. 4. Replace main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
12	Transfer valve leaking/ SYS Err	1. Cassette not loaded properly. 2. Cassette failure. 3. Jammed transfer valve. 4. Solenoid jammed, out of adjustment or loosely mounted. 5. Mechanical failure of solenoid driving the transfer valve. 6. Failure of solenoid driver circuitry on Main PCB.	1. Reload the cassette (follow instructions inside door). 2. Inspect cassette for abnormalities, such as something besides fluid inside the pouches, etc. 3. Check the inlet and transfer valves for freedom of movement by pressing on the valve tips with your finger. Clean or lubricate the valve shaft with silicon spray as needed. Do not spray the valve tips. 4. Make sure the solenoid mounting screws are secure. Check the solenoid adjustment and inspect for evidence of failure such as discoloration from heat or squeaking operation. Make sure the Phillips screws used to attach the entire mechanism assembly to the bezel are secure. 5. Replace the half door/bezel assembly. 6. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
14	Upstream occlusion detected/ UP OCCL	1. Tube obstruction proximal to the pump. 2. Fluid source is empty, or excessive air in cassette. 3. Cassette not loaded properly. 4. Cassette failure. 5. Damaged pressure transducer. 6. Jammed inlet or transfer valves. 7. Solenoid jammed, out of adjustment or loosely mounted. 8. Mechanical failure of solenoid driving the transfer valve, or failure of refill piston. 9. Failure of solenoid driver circuitry on Main PCB.	1. Check tubing between the fluid source and the pump. 2. Check the cassette for excessive air in the pouches. 3. Reload the cassette (follow instructions inside door). 4. Inspect cassette for abnormalities, such as something besides fluid inside the pouches, etc. 5. Inspect the pressure transducer for damage. Replace half door/bezel assembly (see Section 7.7.1.1). 6. Check the inlet and transfer valves for freedom of movement by pressing on the valve tips with your finger. 7. Make sure the solenoid mounting screws are secure. Check the solenoid adjustment and inspect for evidence of failure such as discoloration from heat or squeaking operation. Make sure the Phillips screws used to attach the entire mechanism assembly to the bezel are secure. 8. Replace the half door/bezel assembly. 9. Replace the Main PCB.
15	Backfills allowed should not be 0/ SYS Err	1. Software failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
16	Gross cycle timer error/ SYS Err	1. Software failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
17	Maximum restriction/outlet valve position exceeded/ SYS Err	1. Restriction/outlet valve yoke out of adjustment. 2. Restriction motor failure. 3. Optical sensor on restriction/outlet valve yoke failure or sensor surface is contaminated. 4. Restriction motor driver circuitry on Main PCB failure.	1. Check the restriction/outlet valve yoke adjustment (see Section 7.7.2.1). 2. Replace restriction motor or half door/bezel assembly. 3. Clean the optical sensor and check connections, then retry operation. If this fails to correct the problem, replace the half door/bezel assembly. 4. Replace the Main PCB.
19	Main motor slipped on pressurization step/ If on AC - SYS Err IF on DC - PLUG AC	1. Low battery condition. 2. Main motor carriage driver needs lubrication or is loose. 3. Pressure transducer and/or associated circuitry failure. 4. Main motor failure. 5. Main motor encoder assembly and/or sensor dirty, loose or failed.	1. Plug the pump in and allow it to recharge before operating on battery. 2. Check for rotation of main motor and lubricate carriage driver with B. Braun approved silicon spray only, other lubricants will worsen the problem over time. If loose, replace carriage driver. 3. Inspect the pressure transducer for damage. Replace half door/bezel assembly. 4. Replace the half door/bezel assembly. 5. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. The encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
20	Main motor slipped on retraction step/ SYS Err	1. Low battery condition. 2. Main motor carriage driver needs lubrication or is loose. 3. Pressure transducer and/or associated circuitry failure. 4. Main motor failure. 5. Main motor encoder assembly and/or sensor dirty, loose or failed.	1. Plug the pump in and allow it to recharge before operating on battery. 2. Check for rotation of main motor and lubricate carriage driver with B. Braun approved silicon spray only, other lubricants will worsen the problem over time. If loose, replace carriage driver. 3. Inspect the pressure transducer for damage. Replace half door/bezel assembly. 4. Replace the half door/bezel assembly. 5. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. The encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place.
21	Main motor slipped on delivery step/ If on AC - SYS Err If on DC - PLUG AC	1. Low battery condition. 2. Main motor carriage driver needs lubrication or is loose. 3. Pressure transducer and/or associated circuitry failure. 4. Main motor failure. 5. Main motor encoder assembly and/or sensor dirty, loose or failed.	1. Plug the pump in and allow it to recharge before operating on battery. 2. Check for rotation of main motor and lubricate carriage driver with B. Braun approved silicon spray only, other lubricants will worsen the problem over time. If loose, replace carriage driver. 3. Inspect the pressure transducer for damage. Replace half door/bezel assembly. 4. Replace the half door/bezel assembly. 5. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. The encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
22	Air in the line/ Air	1. Air is trapped in the tubing. 2. The Air-In-Line sensors are contaminated. 3. Air-In-Line block failure.	1. Remove air from the tubing and continue operation. 2. Inspect the tubing channel in the Air-In-Line block for contamination or fluid and clean with a cotton swab and rubbing alcohol if necessary. 3. Replace the Air-In-Line block assembly.
23	Pump processor software error/ SYS Err	1. Pump processor has malfunctioned 2. Pressure transducer and/or associated circuitry damaged or failed.	1. Replace the pump processor. If problem persists, replace the Main PCB. 2. Inspect the pressure transducer for damage. Replace half door/bezel assembly.
24	Downstream occlusion detected/ OCCL	1. Tube obstruction distal to the pump. 2. Restriction/outlet valve sticking or out of adjustment. 3. Restriction motor failure, or mechanism interface PCB. 4. Pressure transducer and/or associated circuitry damaged or failed. 5. Main PCB failure.	1. Check tubing for a closed clamp or kinks in the tubing between the pump and the patient and continue operation. 2. Check the restriction/outlet valve for freedom of movement by pressing on the valve tip with your finger, valve should depress inward against spring resistance. Check the restriction/outlet valve adjustment. 3. Replace restriction motor or half door/bezel assembly (see Section 7.7.2.1). 4. Inspect the pressure transducer for damage. Replace half door/bezel assembly. 5. Replace the Main PCB.
25	Analog to Digital offset value out of specification/ SYS Err	1. Cassette damaged. 2. Pressure transducer and/or associated circuitry failure. 3. Main PCB failure.	1. Replace cassette and retry operation. 2. Inspect the pressure transducer for damage. Test pressure transducer (see Section 7.7.1.1). 3. Inspect the petal module for fluid or any obstruction.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
26	UTL message checksum error/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
27	UTL message invalid length/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
28	UTL message contains invalid destination address/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
29	UTL message queue overrun/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
30	Over temperature alarm/ SYS Err	1. Temperature sensor indicates an over temperature condition. 2. Temperature sensor failure on the Main PCB, or other Main PCB failure. 3. Fan failure.	1. Verify the fan inlet on the bottom of the pump is not obstructed. 2. Replace the Main PCB. 3. Apply power to the fan and replace if it will not operate.
31	Semaphore ID not valid/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
32	Semaphore queue full/ SYS Err	1. Internal software failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
33	Too many "shut down" messages/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
34	Too many "start delivery messages"/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
35	Not ready to start delivery/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
36	Too many "start ramp delivery" messages/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
37	Too many "enter KVO" messages/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
38	Total volume not yet delivered/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
39	Not ready for KVO/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
42	Invalid message type received/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
43	Door open while pump operating/ door	1. Door was opened during fluid delivery. 2. Door sensor failure. 3. Door magnet failure.	1. Verify that the pump door is securely closed. Restart operation. 2. Replace the half door/bezel assembly. 3. Replace the door lever.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
44	DMA (memory transfer) test failure/ SYS Err	1. Microprocessor failure. 2. Main PCB failure.	1. Retry operation and if the error continues, reseat or replace the V25 microprocessor. 2. Replace the Main PCB.
45	RAM (memory) test failure/ SYS Err	1. Microprocessor failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
47	Invalid PRAM (protected memory) element operation/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
48	Primary Rate not set/ 0.0 primary rate	1. PRIMARY RUN Key was pressed with a rate of zero.	1. Enter a valid rate and restart operation.
49	Primary volume not set/ 0.0 primary vtbd	1. PRIMARY RUN Key was pressed with a volume to be delivered of zero.	1. Enter a valid volume to be delivered and restart operation.
50	Piggyback Rate not set/ 0.0 piggyback rate	1. PIGGYBACK RUN Key was pressed with a rate of zero.	1. Either enter a valid piggyback rate, or press the PRIMARY RUN Key.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
51	Piggyback Volume not set/ 0.0 piggyback vtbd	1. PIGGYBACK RUN Key was pressed with a volume to be delivered of zero.	1. Either enter a valid piggyback volume to be delivered, or press the PRIMARY RUN Key.
52	Hold time exceeded/ HOLD	1. Pump has remained in the HOLD state with door closed for too long.	1. Resume operation or press the HOLD Key again.
53	Invalid Op Log Event/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
54	Bad Light Emitting Diode (LED) on the front panel/ SYS Err	1. An LED on the front panel is failing to draw current, or is drawing current when it should not.	1. Replace the LED display PCB.
55	Invalid parity on Door Processor message/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
56	Invalid Door Processor message command/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Check all cable connections inside the door. 4. Retry operation and if error continues, replace the Main PCB.
57	Invalid Door Processor message digit/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
58	Initial bit not set on Door Processor message/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
59	No watchdog OK message from Door Processor/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Faulty door connector on mechanism interface PCB. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
60	Stack error on Door Processor message/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
61	Invalid group in Door Processor message/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
62	Invalid parity on Door Processor to Management Processor (Main Processor) message/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
63	Direction bit failure/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
64	Unknown Door Processor command/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
65	Door Processor message queue full/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable: Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
66	Invalid Door Processor get state/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
67	System Initialization: timer initialization test failure/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
68	System Initialization: pump communication failure/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
69	System Initialization: Door Processor communication failure/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
70	System Initialization: Pump Rx Time-out/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
71	System Initialization: primary alarm failure/ SYS Err	1. Speaker failing to draw current or the speaker connector has come loose. 2. Main board failure.	1. Reseat the connector and if the problem continues, replace the speaker assembly or speaker/fan assembly. 2. Replace the Main PCB
72	Pump Processor OK message not received/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
73	Door Processor OK message not received/ SYS Err	1. Faulty door connector on mechanism interface PCB. 2. Faulty ground shielding on cosmetic bezel. 3. Faulty LED display PCB. 4. Faulty main processor (on the Main PCB).	1. Reseat the door connector on the mechanism interface board. 2. Check grounding clips on each end of door cable. Check copper grounding springs on the case bottom and mechanism. 3. Replace the LED display PCB and check all cable connections inside the door. 4. Replace the Main PCB.
74	Main Processor OK message not received/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, then replace the Main PCB or return the pump for service.
75	PRAM (protected memory) failure/loss of memory configuration SYS Err	1. Processor EPROMs were just installed. 2. Discharged 3V battery. 3. Main PCB failure. 4. Device returned to Service Center for repair.	1. This is normal and expected when the EPROMs are changed. Cycle the pump off then on again. 2. Test 3V lithium battery with a voltmeter and the device turned off and unplugged. Replace if less than 1.5V DC. 3. Replace the Main PCB. 4. All devices returned to Service Center will be set to factory defaults.
76	Battery very low/ USE AC	1. Battery charge is nearly depleted. 2. Damaged battery. 3. Main PCB failure.	1. Plug the pump in and allow it to recharge. Then perform a battery capacity check. 2. Remove battery and inspect for obvious damage. Even if no damage is visible, the battery may still be bad. Charge and test. 3. Replace the Main PCB.
77	Dose Menu Error/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
78	Send Door Processor message failure/ SYS Err	1. Internal software communication failure. 2. Display board PCB failure or the connector between the display board and the Main PCB has come loose.	1. Retry operation and if error continues, replace Main PCB or return the pump for service. 2. Reseat the connector and if the problem continues, replace the LED PCB assembly.
79	Test Air in Line detector malfunction/ SYS Err	1. Failure of the test Air-In-Line sensors. 2. Failure of port input pin on the 80C537 microprocessor on the main board.	1. Check Air-In-Line cable for proper connection. 2. Check the Air-In-Line PCB for cold solder joint or fluid. 3. Replace the Air-In-Line block. 4. Replace the Main PCB.
80	Main Air in Line detector malfunction/ SYS Err	1. Failure of the main Air-In-Line sensors. 2. Failure of port input pin on the 80C537 microprocessor on the main board.	1. Clean the Air-In-Line detector PCB and retry operation if problem persists replace the Air-In-Line block. 2. Replace the Main PCB.
81	Main Processor message checksum error/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
82	Main Processor message invalid length/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
83	Main Processor message invalid destination/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
84	Main Processor message queue overrun/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
85	Set not present/ CASS	1. The RUN Key was pressed with the tubing detector indicating that no set was present.	1. Install a set in the pump prior to activating the RUN Key.
86	Time of Day time invalid/ SYS Err	1. Internal real-time clock contents corrupted. 2. Main PCB failure.	1. 3 V lithium battery (disc shaped) discharged. Test with a voltmeter with device turned off and unplugged. Replace if less than 1.5 V. 2. Replace the Main PCB.
87	Time of Day initialization failure/ SYS Err	1. Internal real-time clock fails initialization process. 2. Power supply failure.	1. Replace the Main PCB or return the pump for service. 2. Replace the power supply.
89	Pump Processor receive interrupt service routine contains invalid destination address/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
90	Pump Processor receive character not synchronized/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
91	System Integrity Check: Main Processor bad EPROM checksum/ SYS Err	1. Internal software communication failure. 2. Failure of the Main Processor EPROM.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
92	Start up message failure/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
93	System Integrity Check: Pump Processor bad EPROM checksum/ SYS Err	1. Internal software communication failure. 2. Failure of the Pump Processor or ACTEL ICs.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
94	System Integrity Check: Main Processor invalid program sequence/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
95	System Integrity Check: Pump Processor invalid program sequence/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
96	System Integrity Check: Main Processor stack overflow/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
97	System Integrity Check: Pump Processor stack overflow/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
98	System Integrity Check: Main Processor Invalid Special Function Register state/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
99	System Integrity Check: Pump Processor Invalid Special Function Register state/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
100	System Integrity Check: Main Processor unexpected interrupt/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
101	Membrane key stuck/ SYS Err	1. Key panel failure. 2. Door processor PCB failure, or the connector between the door assembly and the Main PCB has come loose. 3. Main PCB failure.	1. Replace the key panel. 2. Reseat the connector and if the problem continues, replace the LED display PCB. 3. Replace the Main PCB.
102	Coprocessor enter KVO time-out/ SYS Err	1. Failure to enter KVO within specified time limit.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace main PCB.
103	Coprocessor start delivery time-out/ SYS Err	1. Failure to initiate motor motion within 10 seconds.	1. Retry operation and if error continues, reseat or replace the EPROMs.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
104	Coprocessor parameters change time-out/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
105	Coprocessor shutdown time-out/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
106	Coprocessor start ramp time-out/ SYS Err	1. Failure to begin delivery of fluid after start of ramped delivery.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
108	Coprocessor over infusion failure/ SYS Err	1. Fluid continued to be delivered after volume to be delivered goes to zero. 2. Main motor encoder wheel and sensor damaged. 3. Main PCB failure.	1. Inspect the main motor encoder wheel and sensor for dust or other contamination or damage. Clean if necessary. 2. Replace half door/bezel assembly. 3. Replace the Main PCB.
110	Coprocessor under infusion failure/ SYS Err	1. Main motor encoder wheel and sensor damaged. 2. Failure to perform as many delivery steps as required for initial volume to be delivered.	1. Inspect the main motor encoder wheel and sensor for dust or other contamination or damage. Clean if necessary. 2. Replace the Main PCB.
111	Coprocessor rate ramped time-out/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
112	Coprocessor test air in line test failure/ SYS Err	1. Air in the set or contaminated sensor. 2. Air-In-Line block failure. 3. Pump processor failure to activate Air-In-Line emitters.	1. Remove the air and clean the sensor with alcohol and a cotton swab. 2. Replace the Air-In-Line block assembly. 3. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
113	Coprocessor main air in line test failure/ SYS Err	1. Air in the set or contaminated sensor. 2. Air-In-Line block failure. 3. Pump processor failure to report air in line.	1. Remove the air and clean the sensor with alcohol and a cotton swab. 2. Replace the Air-In-Line block assembly. 3. Replace the Main PCB.
114	Coprocessor solenoid test failure/ SYS Err	1. Pump processor activated transfer valve solenoid during delivery. 2. Solenoid failure.	1. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK. 2. Replace the solenoid or half door/ bezel assembly.
115	Coprocessor main backward test failure/ SYS Err	1. Pump processor takes reverse steps during delivery.	1. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK.
116	Coprocessor main forward test failure/ SYS Err	1. Pump processor is stepping forward during over pressurization condition. 2. Main PCB failure. 3. Pressure transducer and/or associated circuitry failure.	1. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. The encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place. 2. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK. 3. Inspect the pressure transducer for damage.
117	Coprocessor restriction/outlet valve closed test failure/ SYS Err	1. Restriction/outlet valve closed during over pressurization.	1. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
118	Coprocessor main motor stepping fast/ SYS Err	1. Pump processor forward delivery steps are occurring too fast. The main motor encoder wheel and sensor are contaminated or damaged. 2. Poor connections. 3. Main PCB failure. 4. Pressure transducer and/or associated circuitry failure.	1. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. The encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place. 2. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK. 3. Replace the Main PCB. 4. Inspect the pressure transducer for damage.
119	Coprocessor main motor stepping slow/ SYS ERR	1. Pump processor forward delivery steps are occurring too slow. The main motor encoder wheel and sensor are contaminated or damaged. 2. Poor connections. 3. Main PCB failure.	1. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. The encoder wheel should be centered between its sensor and rotate with moderate resistance. Return to position if necessary by sliding it into place. 2. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK. 3. Replace the Main PCB.
120	Coprocessor main motor not stepping/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
121	Coprocessor restriction motor not stepping/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
122	Coprocessor no logical interrupt/ SYS Err	1. Pump processor is not causing step signals during delivery.	1. Check for good connection between the Main PCB and mechanism interface board then replace the Main PCB if connection OK.
123	Power glitch encountered/ If on AC - SYS Err If on DC - PLUG AC	1. Discharged battery. 2. Fuse 2 on Main PCB damaged or missing. 3. Damaged battery. 4. Main PCB failure.	1. This is normal and expected when the pump is allowed to infuse until the emergency backup alarm comes on. Plug the pump in and allow it to recharge. Then perform a battery capacity check. 2. Check Fuse 2 for continuity. 3. Remove battery and inspect for obvious damage. Even if no damage is visible the battery may still be bad. Replace and retest. 4. Replace the Main PCB.
124	Receive message buffer overrun/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
126	AD offset not zero/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
127	Coprocessor occlusion test failure/ SYS Err	1. Delivery chamber has remained over pressure for too long without an occlusion alarm. Pressure transducer and/or associated circuitry failure. 2. Main PCB failure.	1. Check for obstruction in the tubing. Retry operation and if error continues, inspect the pressure transducer for damage. 2. Replace the Main PCB.
128	System Integrity Check: no ambient light message/ SYS Err	1. LED display PCB failure. 2. Main PCB failure.	1. Retry operation and if error continues, replace the LED display PCB. 2. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
129	OPM software error/ SYS Err	1. Internal software failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
130	Coprocessor over rate test/ SYS Err	1. Pump processor delivery rate (during ramped delivery) is too high.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
131	Coprocessor under rate test/ SYS Err	1. Pump processor delivery rate (during ramped delivery) is too low.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
132	Coprocessor invalid rate test/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat the EPROMs. 2. Replace Main PCB.
133	Coprocessor next delivery step test/ SYS Err	1. Pump processor stopped delivering fluid. 2. Main motor damaged.	1. Replace the Main PCB. 2. Replace the half door/bezel assembly.
134	Flow clamp out of position/ SEE HELP (help is displayed on the LCD)	1. The RUN Key was pressed with the flow clamp out of position. 2. Attempting to use tubing without an Anti-Freeflow device. 3. The optical sensor in the flow clip receptacle assembly is wet or failed. 4. Main PCB failure.	1. Verify that the set tubing is properly installed in the pump. 2. Verify proper tubing is being used. 3. Allow to dry then retry. If reoccurs, then replace the flow clip receptacle assembly. 4. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
135	Main motor slip during forward non- pressurization step/ If on AC - SYS Err If on DC - PLUG AC	1. Low battery condition. 2. Black, negative sensor wire connecting the battery to the Main PCB has a poor connection. 3. The main motor encoder wheel and sensor are contaminated or damaged. 4. Main motor failure. 5. Main PCB failure.	1. Plug the pump in and allow it to recharge. 2. Verify continuity between the main battery ground wires and the Main PCB. Break may be hidden by shrink wrap at the battery connection side. Resolder or replace wires if needed. 3. Inspect the main motor encoder wheel for dust or other contaminant and clean with cleaner or air blast if necessary. Encoder wheel should be centered between its sensor and should rotate with moderate resistance. If jammed, it may need some force to rotate free. Return to position if necessary by sliding it into place. 4. Replace the half door/bezel assembly. 5. Replace the Main PCB.
136	DMA (memory) process time-out/ LCD Err	1. Failure of the Liquid Crystal Display (LCD) driver circuitry on the LCD controller PCB. 2. Internal software communication failure.	1. Replace the LCD controller PCB. 2. Retry operation and if error continues, replace Main PCB or return the pump for service.
137	Optical Yoke adjustment measurement out of specification/ SYS Err	1. Restriction/outlet valve yoke sticking or out of adjustment. 2. Faulty restriction motor in mechanism. 3. Faulty motor drive circuitry on Main PCB	1. Check the restriction/outlet valve for freedom of movement by pressing on the valve tip with your finger, valve should depress inward against spring resistance. Check the restriction/outlet valve yoke adjustment. 2. Replace the restriction motor or half door/bezel assembly. 3. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
138	Backup alarm unexpectedly activated/ SYS Err	1. Fuse 2 is damaged or missing. 2. Low battery condition. 3. Damaged battery. 4. Hardware failure on Main PCB.	1. Check Fuse 2 for continuity . Check all connections to Main PCB. 2. Plug the pump in and allow it to recharge. Then perform a battery capacity check. 3. Remove battery and inspect for obvious damage. Even if no damage is visible, the battery may still be bad. Replace and retest. 4. Replace the Main PCB.
139	Batteries Improperly Connected/ SYS Err	1. Batteries are not properly connected. 2. Low battery condition. 3. Damaged battery. 4. Main PCB failure.	1. Verify all batteries have good connections. 2. Plug the pump in and allow it to recharge. Then perform a battery capacity check. 3. Remove battery and inspect for obvious damage. Even if no damage is visible the battery may still be bad, replace and retest. 4. Replace the Main PCB.
140	Battery sense wire broken/ SYS Err	1. Pump is on DC operation and battery voltage reads less than main voltage. The ground wires connecting the main battery to the Main PCB have a poor connection. 2. Analog to Digital measurement error on Main PCB.	1. Verify continuity between the main battery ground wires and the Main PCB. Break may be hidden by shrink wrap at the battery connection side. Resolder or replace wires if needed. 2. Check the Analog to Digital offset and replace the Main PCB if abnormal. See Section 7.7.1.1.
141	Unexpected power down message/ SYS Err	1. A power-down message was received without an associated POWER Key press.	1. Visually inspect Main PCB for disconnected wires or improperly seated ICs. If problem persists, replace the Main PCB.
142	Pressure Transducer EEPROM error/ SYS Err	1. The pressure transducer EEPROM is faulty. 2. The EEPROM drivers on the Main PCB are faulty.	1. Check cables and connectors to door and pressure transducer. Replace the half door/bezel assembly. 2. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
143	Door Display EEPROM error/ SYS Err	1. The display EEPROM is faulty. 2. The EEPROM drivers on the Main PCB are faulty.	1. Check cables and connectors to door. Replace the LED PCB assembly. 2. Replace the Main PCB.
144	Door LED power low/ SYS Err	1. LED test power circuit failure. Note: This alarm differs from 54 in that it tests for power supplied to the PCB, not a LED segment failure.	1. Check door cable and connectors. Replace the LED PCB assembly.
145	FP Math Error/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
146	Qx Overlap error/ SYS Err	1. Internal software communication failure.	1. Retry operation and if error continues, reseat or replace the EPROMs. 2. Replace Main PCB.
147	PRAM corruption SYS Err	1. Corruption of control data for PRAM.	1. PRAM will automatically re-initialize. 2. Power cycle the pump and redock.
148	PRAM corruption SYS Err	1. Corruption of index of PRAM.	1. PRAM will automatically re-initialize. 2. Power cycle the pump and redock.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
	Pump will not operate on AC	1. Power cord cut or loose. 2. Power supply failure. 3. Main PCB failure. 4. Key panel failure. 5. Door processor or LED PCB failure. 6. Fluid intrusion.	1. Check the cord for continuity and placement. 2. Remove power supply and inspect for damage, loose wires or components. If fuses open, test Q1 on the power supply PCB. If FU1 or FU2 open, replace Q1 and U1 and the fuses on the power supply PCB. Q1 is the crowbar transistor intended to fail prior to other component failure. Replace fuses or power supply as necessary. 3. Replace the Main PCB. 4. Replace the key panel. 5. Replace the LED PCB assembly. 6. Open pump and look for evidence of fluid intrusion. If found, wipe off all damp components and allow to dry thoroughly before attempting operation again. If unsuccessful, return the pump for service.
	Pump does not power off with door closed	1. Key panel failure. 2. Main PCB failure. 3. Door processor or LED PCB failure. 4. Fluid intrusion.	1. Replace the key panel. 2. Test main board by shorting the on/off pads on the front of the main board. Replace the Main PCB. 3. Replace the LED PCB. 4. Open pump and look for evidence of fluid intrusion. If found, wipe off all damp components and allow to dry thoroughly before attempting operation again. If unsuccessful, return the pump for service.
	Pump emits continuous high pitched sounding alarm and will not turn on	1. Low battery condition. 2. Defective power supply. 3. Main PCB failure. 4. Short in additional subassemblies.	1. Plug the pump in and cycle the power on and off then allow it to recharge. 2. Replace power supply. 3. Replace the Main PCB. 4. Isolate defective subassembly(ies).

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
	Pump slips down pole	1. Pump improperly mounted on pole. 2. Foreign material on pole such as a lubricant. 3. QuickClamp™ mechanism failure. 4. Check that I.V. pole is within specifications (0.75" to 1.25")	1. The clamp may have been locked before it was tightened. 2. Clean the pole of all foreign materials. 3. Check to ensure that the rubber material is firmly in place and reapply with an approved adhesive material. 4. Check for cracks in QuickClamp plastic assembly and replace the clamp mechanism if any are found.
	LCD has no backlight	1. LED Display PCB failure 2. Short between the right side of the LCD PCB and the inside of the cosmetic bezel, when pressure is applied the that portion of the cosmetic bezel.	1. Replace the LED Display PCB. 2. Verify that the insulating tape is properly covering the right side of the LCD PCB and the metal clip inside the right edge of the cosmetic bezel.
	LCD flickers erratically or goes blank	1. Low battery condition. 2. Cable between the door and the mechanism has dislodged. 3. LCD assembly failure. 4. LED PCB failure. 5. Bent pin on the 100 pin main board connector.	1. Plug the pump in and verify that the LCD works correctly. 2. Reseat the connector. 3. Replace the LCD assembly. 4. Replace the LED PCB assembly. 5. Straighten the pin and re-connect.
	Pump will not operate on battery	1. Battery has completely discharged. 2. Battery cables may be damaged. 3. Fuse number 2 on Main PCB has been damaged or loose. 4. Main PCB failure.	1. Plug the pump in and allow it to fully recharge before attempting battery operation. 2. Check battery cables and connectors for damage. 3. Inspect the fuse and replace as needed. 4. Replace the Main PCB.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
	Unable to download operation, alarm log, or configuration	1. Pump not placed in proper mode. 2. Monitor Communications set to "Monitor." 3. Cables and/or connectors are not properly seated. 4. Cable not in serial port. 5. Misalignment of the infrared (IR) transceivers, or the IR window is dirty. 6. Cables and/or connectors are damaged. 7. Transmitting LEDs are damaged or bent.	1. Put pump in Biomed menu. Access operation or alarm log and select transmit with P.C. in Docking Program, receive operation log. 2. Monitor Communications must be set to either "Disabled" or "Demo." 3. Check cable connections. 4. Ensure cable is in serial port (9 pin). 5. Verify that the transceiver box is properly mounted on the pump. Clean the IR window. 6. Ensure that the connectors between the pump and the computer are not damaged. Try an alternate cable. 7. Verify that the transmitting LED is not bent. If damaged, replace the Main PCB. Remove case top and visually align receiver LEDs with main board LEDs; hold and retry.
	Unable to perform panel lockout.	1. Pump not infusing. 2. Panel lock out switch failure. 3. Main PCB failure.	1. Pump must be infusing to activate lock out. 2. Verify that the switch is being depressed properly, is not bent or damaged. 3. Replace the Main PCB.
	No audible alarm.	1. Main alarm speaker has failed. 2. Connector to the speaker has dislodged. 3. Main PCB failure.	1. Replace the speaker assembly. 2. Reseat the connector. 3. Replace the Main PCB.
	Pump makes a grinding or ratcheting noise upon power up or down. Immediately gives SYS Err	1. Main motor is jammed.	1. Remove main motor from mechanism. Unscrew carriage driver from shaft of main motor. Lubricate with CRC brand silicone spray and re-assemble.

Table 1: Troubleshooting Guide

Code	Error Description/Message on LED's	Probable Cause	Corrective Action
	LCD scrolling	1. LED board failure. 2. LCD failure. 3. Main PCB failure.	1. Examine for poor or misaligned connections. Replace LED PCB or replace the LED display board. 2. Replace the LCD display if necessary. 3. Replace the Main PCB.
	Displays flash on and off	1. Pump processor EPROM failure. 2. Pump processor failure. 3. Main PCB failure.	1. Replace or reseat the pump processor EPROM. 2. Replace or reseat pump processor. 3. Replace the Main PCB.
	LED displays Err 5	1. LED display PCB failure. 2. Main PCB failure.	1. Replace the LED display PCB. 2. Replace Main PCB.
	Short operating time to LOW BATT alarm	1. Main battery in a low condition. 2. Main battery no longer accepts a charge. 3. Main PCB failure.	1. Plug the pump in and allow it to fully recharge. Inspect Fuse 2 on the Main PCB. 2. Replace the battery (recommended at 2-year intervals). 3. Replace the Main PCB.

APPENDIX C: Operation Log

Below is an example of a portion of an Operation Log as will be seen when viewing the file on your computer. If the log is full, the print out will be approximately 20-24 pages long, with the most recent event placed at the end of the printout:

VERSION C C B
B. Braun
Horizon Nxt Operation Log

ACH = active channel
ALM = alarm
ALV = alarm volume
APG = allow program
ATV = allow time & vol
CDU = dose concentration units
DDA = dose drug amount
DOS = dosage
DPW = dose patient weight
DSV = dose solution vol
DVL = dose volume
GCV = program current vol
GSR = program set rate
IDS = initial data start-up
IPT = pressure start-up type
IST = infusion status
LCN = lcd contrast
MKC =key click signal
MMD = micro mode
PCR = profile current rate
PDV = ramp down vol
PLR = profile level rate
PRR = profile ramp rate
PTT = profile total time
PUT = profile ramp up time
PVL = profile volume
QXS = qx start time
QXR = qx rate
QXV = qx total volume
REM = time remaining
SBR = STD piggyback rate
SPR = STD primary rate
STRT= start time

AFL = allow flush
ALT = alternate alarm
APF = allow profile
APY = allow piggyback
BLV = battery level
CMD = current mode
DDU = dose drug units
DPU = dose patient unit
DRT =dose rate
DTU = dose time units
FLV = flush volume
GPD =program period
GSV = program set volume
IPR = infusion pressure
IPV =initial pressure
KOR = KVO rate
LST = line status

MTS = transition signal
PDT =ramp down time
PHU =patient height unit
PMR =profile max rate
PST = profile stage
PTV = profile total volume
PUV =profile ramp up vol
PWU = patient weight unit
QXI = QX interval
QXD = QX dose volume

SLV =STD last volume
SBV =STD piggyback volume
SPV = STD primary volume

TDY = day
TI = total infused
TMO = month
VTD = volume to deliver
THR = hour
TMN = minute
UPR = user pressure
ZTM = pause time

STANDARD POWER UP
ACH = PRIMARY SPR = 0.0 SPV = 0.0 SBR = 0.0 SBV = 0.0
UPR = 300 TI = 0.0 REM =10 hours 0 minutes
TMO = 11 TDY = 5 THR = 10 TMN = 4 LST =Uninitialized BLV = 0

MENU SETTINGS
ALV = HIGH LCN = 7 IDS = POWER UP IN STANDARD MODE
MMD = Adult IPT = FIXED IPV = 300
APF = Profile Enabled APG = Program Disabled
ATV = Time Vol Disabled APY = Piggyback Enabled
MTS = Disabled ALT= Off MKC = Enabled
TMO = 11 TDY = 5 THR = 10 TMN = 4

PRIMARY START
ACH = PRIMARY SPR = 100.0 SPV = 100.0 SBR = 0.0 SBV 0.0
UPR = 300 TI = 0.0 REM = 1 hours 0minutes
TMO = 11 TDY = 5 THR = 10 TMN = 5 LST = Battery BLV = 95

STANDARD ALARM
ALM = 24 Downstream Occlusion
ACH = PRIMARY SPR = 100.0 SPV = 98.7 SBR = 0.0 SBV 0.0
UPR = 300 TI = 1.3 REM = 0 hours 58 minutes
TMO = 11 TDY = 5 THR = 10 TMN = 7 LST = Battery BLV = 78

STANDARD HOLD
ACH = PRIMARY SPR = 100.0 SPV = 98.7 SBR = 0.0 SBV 0.0
UPR = 300 TI = 1.3 REM = 1 hours 0minutes
TMO = 11 TDY = 5 THR = 10 TMN = 7 LST = Battery BLV = 78

PRIMARY START
ACH = PRIMARY SPR = 100.0 SPV = 98.7 SBR = 0.0 SBV 0.0
UPR = 300 TI = 1.3 REM = 0 hours 58 minutes
TMO = 11 TDY = 5 THR = 10 TMN = 7 LST = Battery BLV = 78

KVO START
CMD = Standard KOR = 3.0 UPR = 300 TI = 100.0
TMO = 11 TDY = 4 THR = 11 TMN = 5 LST = Battery BLV = 75

STANDARD HOLD
ACH = PRIMARY SPR = 100.0 SPV = 0.0 SBR = 0.0 SBV 0.0
UPR = 300 TI = 100.0 REM = 0 hours 0 minutes
TMO = 11 TDY = 5 THR = 11 TMN = 7 LST = Battery BLV = 65

HOLD EXTEND START
CMD = Standard ZTM = 0 hr 3 min 0 sec
TMO = 11 TDY = 5 THR = 11 TMN = 7 LST = AC

HOLD EXTEND END
CMD = Standard ZTM = 0 hr 2 min 54 sec
TMO = 11 TDY = 5 THR = 11 TMN = 7 LST = AC

PRIMARY START
ACH = PRIMARY SPR = 100.0 SPV = 20.0 SBR = 0.0 SBV = 0.0
UPR = 300 TI = 100.0 REM = 0 hours 12 minutes
TMO = 11 TDY = 5 THR = 11 TMN = 8 LST = AC BLV = 0

STANDARD ALARM
ALM = 9 System Alarm
ACH = PRIMARY SPR = 100.0 SPV = 20.0 SBR = 0.0 SBV = 0.0
UPR = 300 TI = 100.0 REM = 0 hours 12 minutes
TMO = 11 TDY = 5 THR = 11 TMN = 8 LST = AC BLV = 0

STANDARD HOLD
ACH = PRIMARY SPR = 100.0 SPV = 20.0 SBR = 0.0 SBV = 0.0
UPR = 300 TI = 100.0 REM = 0 hours 12 minutes
TMO = 11 TDY = 5 THR = 11 TMN = 8 LST = AC BLV = 0

PRIMARY START
ACH = PRIMARY SPR = 80.0 SPV = 20.0 SBR = 0.0 SBV = 0.0
UPR = 300 TI = 0.0 REM = 0 hours 15 minutes
TMO = 11 TDY = 5 THR = 11 TMN = 8 LST = AC BLV = 0

STANDARD ALARM
ALM = 22 Air-in-Line
ACH = PRIMARY SPR = 80.0 SPV = 7.0 SBR = 0.0 SBV = 0.0
UPR = 300 TI = 13.0 REM = 0 hours 5 minutes
TMO = 11 TDY = 5 THR = 11 TMN = 8 LST = AC BLV = 0